Transition from shallow to deep convection near the ITCZ over the Pacific Ocean: Idealistic experiments.

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1 Introduction

In the past, most studies have been focused on the transition from shallow to deep cloud over land. Because the heavy precipitation amounts over land were and are still a concern for the public and human activities. However, oceans cover about 70% of the earth surface and cloud live cycle over the ocean is usually longer than over land. This study is designed to understand which phenomena trigger the deep convection over Ocean. Cloud impacts are significant in the Earth atmosphere, in both traditional aspects of Atmospheric numerical prediction; climate prediction and short/medium range prediction (6h to 1 week).

2 Idealistic experimental setup

A periodic simulation (100x100km domain) is performed over a cross section of the Pacific Ocean from mid-latitude (35 degree North) to ITCZ (figure 1). The simulation starts in the mid-latitude with an homogeneous stratus cloud initialized over the all domain. The speed velocity of the cloud is set to be constant a 7 m/s. The mean Sea Surface Temperature (SST) observations on June/July/August 1998 are used to force the simulation (NOAA Optimum Interpolation Sea Surface Temperature Data Set). The impact of the Hadley circulation is also included in the simulation by computing the large scale mean subsidence/convergence over June/July/August 1998 from the ERA-40 reanalysis. The large scale subsidence is located in the mid-latitude and the trade-wind zone whereas the large scale ascendant motion is between 10 and 0 degree north. Along the Pacific cross section trajectory, the initialized shallow cloud is going to evolve in strato-cumulus clouds and finally in cumulonimbus clouds.

3 Results of the idealistic experiment

Simulation results are analysed to understand the mechanisms that trigger deep convection over the Pacific is simplified context. A set of sensitivity experiments is performed to understand the role of SST and the large scale vertical motion on the cloud development and the transition phase.

Figure 1: Mean SST (June/July/August 1998) over the Pacific Ocean and the Pacific cross section track used for the idealistic simulation.